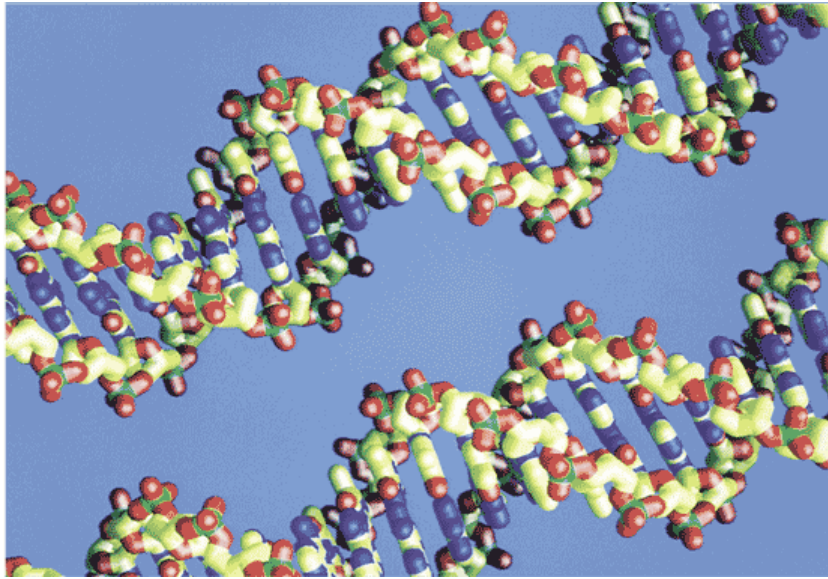


# Mutation Notes

## Chapter 12 section 4



## Genes and Proteins

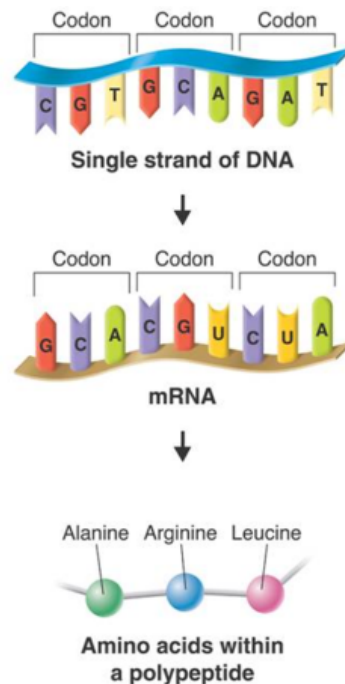
Genes contain instructions for assembling proteins.

Many proteins are enzymes, which catalyze and regulate chemical reactions.

Proteins are each specifically designed to build or operate a component of a living cell.

The sequence of bases in DNA is used as a template for mRNA.

The codons of mRNA specify the sequence of amino acids in a protein.



## Kinds of Mutations

Mutations that produce changes in a single gene are known as **gene mutations**.

Mutations that produce changes in whole chromosomes are known as **chromosomal mutations**.

## Chromosomal Mutations

Chromosomal mutations involve changes in the number or structure of chromosomes.

Chromosomal mutations include deletions, duplications, inversions, and translocations

Deletions involve the loss of all or part of a chromosome.



Original chromosome



Deletion

Duplications produce extra copies of parts of a chromosome.



Original chromosome



Duplication

Inversions reverse the direction of parts of chromosomes.

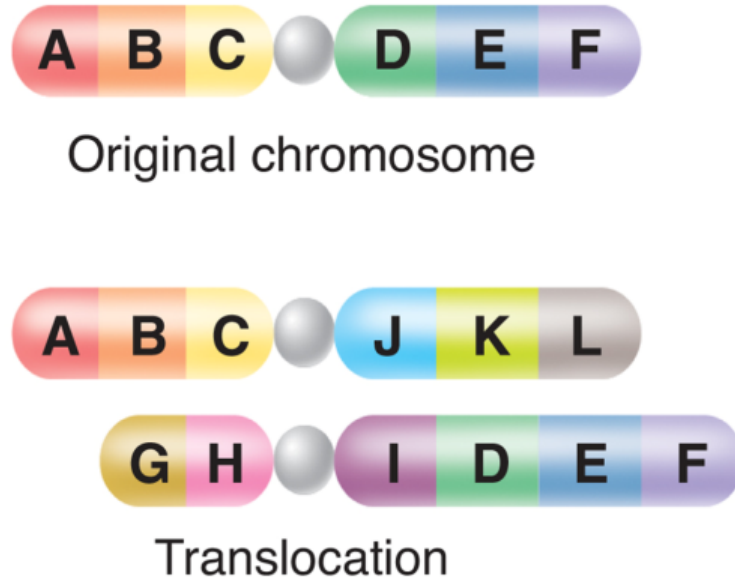


Original chromosome



Inversion

Translocations occurs when part of one chromosome breaks off and attaches to another.

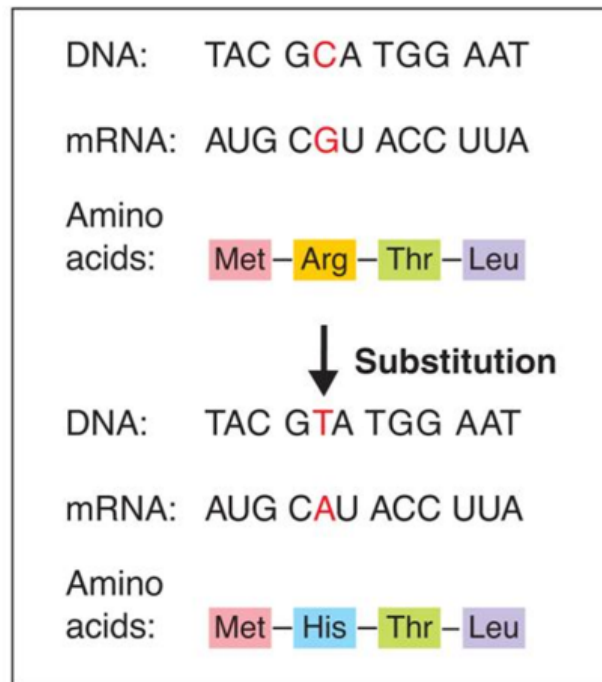


**Gene Mutations-** occur in a single gene. Gene mutations involving a change in one or a few nucleotides are known as **point mutations** because they occur at a single point in the DNA sequence.

Point mutations include substitutions, insertions, and deletions.

Substitutions - one base is changed to another base.

Substitutions usually affect no more than a single amino acid and most do not cause a difference.



Insertions- adding an extra base

THE CAT ATE THE RAT

THE CAT AET ETH ERA T

↑

Deletions- removing a base.

The A in ATE is deleted

THE CAT TET HER AT

The effects of insertions or deletions are more dramatic.

The addition or deletion of a nucleotide causes a shift in the grouping of codons.

Changes like these are called **frameshift mutations**.

Frameshift mutations may change every amino acid that follows the point of the mutation.

Frameshift mutations can alter a protein so much that it is unable to perform its normal functions.